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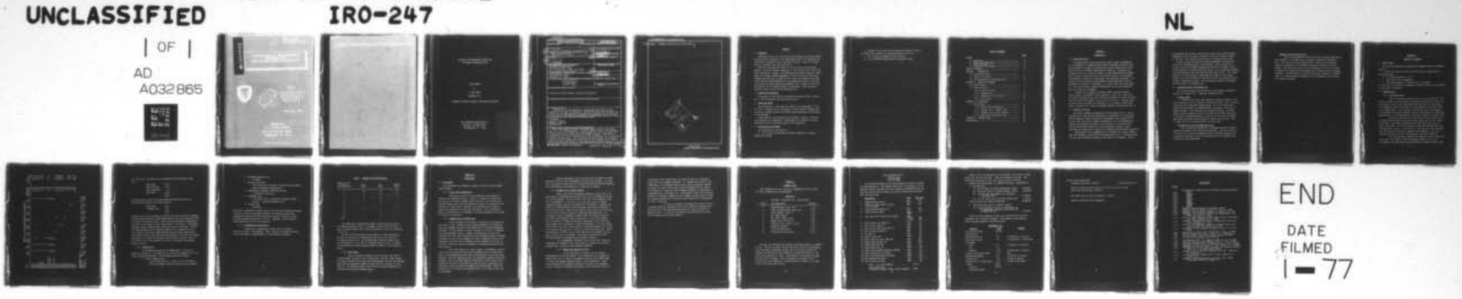

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EVALUATION OF PROCUREMENT ALTERNATIVES FOR COMSEC INSTALLATION KITS

FINAL REPORT

BY

W. KARL KRUSE

NOVEMBER 1976

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This study evaluates several alternative ways to obtain installation kits, IK's, for COMSEC equipment. The basic issues evaluated were from whom should the parts be obtained; who should assemble the kits; when should IK's be assembled; and who should manage the assembly program. Costs were not available for all of the relevant factors, but, nevertheless, were the driving forces of the evaluation. The conclusions are that IK piece parts should be obtained through a competitive process and the IK's assembled at the COMSEC depot under the direct control of the Communications Security Logistics →

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cont. Agency. Assembly batches should be kept small.

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SUMMARY

1. Background

Installation Kits, IK's, are sets of parts required to install Communications Security equipment in its operating location. The equipment can typically be installed in any of several locations. Thus, for a given piece of equipment there are several IK's.

Recently, costs and lead times for the IK's have been increasing sharply. Given the inherent simplicity of the IK piece parts, this trend seems unwarranted. However, the Communications Security Logistics Agency, CSLA, who recently assumed management of the IK's from the Electronics Command, has been able to obtain the IK's only from Tobyhanna Army Depot since definitive specifications are not available for most of the parts. In the next few years several new equipments will be issued to the field and CSLA can opt for another method of procurement. CSLA, therefore, desires to know the best way of obtaining IK's.

2. Purpose and Objectives

The purpose of this study is to evaluate alternative ways to obtain IK's. The alternatives were identified by CSLA.

3. Scope and Method

The conclusions of this study are limited to the management of CSLA IK's only. Extension of the conclusions to other similar programs such as tool kit assembly should not be made without assessing the differences of the programs.

Where possible, cost estimates were obtained. However, a complete cost comparison was impossible. Nevertheless, the dominant costs were obtained and were the driving factors of the evaluation.

4. Conclusions and Findings

The conclusions of the study are:

a. The IK piece parts should be obtained commercially through a competitive process.

b. Assembly of the kits from the piece parts should be done at the COMSEC depot located at Lexington-Bluegrass Army Depot.

c. IK's should be assembled in small batches.

d. The IK assembly program should be managed by CSLA.

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CHAPTER I

INTRODUCTION

1.1 Installation Kits

The Communications Security Logistics Agency, CSLA, is responsible for the management of Communications Security equipment used by the Army. This equipment is designed by the National Security Agency and is available for use by all Federal departments and agencies. Basically, the equipment function is either to encode or decode communications messages. Until recently, around the time of the Vietnam conflict, the equipment was designed to function in a particular type operating environment. But during the Vietnam conflict new equipment was developed which could be installed in a variety of locations; i.e., truck, jeep, tank, back pack, etc. For each location a special Installation Kit, IK, was required to mount or install the equipment.

A typical IK is composed of coaxial cables, mounting brackets, bolts, screws, and possibly a small amplifier. Since for a given piece of security equipment there will be several different IK's, quite naturally there are piece parts common to two or more of the IK's. Likewise there are parts that are similar but different, as, for example, cables which differ in length only. There are normally between 10 and 20 parts per IK.

1.2 Source of the IK's

Electronics Command is responsible for the design of IK's. Often, Tobyhanna Army Depot provides assistance in development of IK protytypes. This arrangement prevailed during the development of the original IK's. At that time, there was an urgent requirement to field the equipment in Vietnam, and emphasis was placed on the creation of a production base. With Tobyhanna's participation in the prototyping, the way to begin producing the fastest was to make use of Tobyhanna's manufacturing capability.

Unfortunately this arrangement gave no incentive to produce Procurement Data Packages for the piece parts composing the IK's. Tobyhanna worked from the same preliminary sketches it had used for prototyping. Without

a Procurement Data Package, which provide detailed item specifications, Tobyhanna was the only source available to ECOM, the original manager of the IK's. This condition still exists for those particular IK's.

Within the last two years CSLA assumed management responsibility for the IK's and inherited not a few problems. Some are specific to certain items such as design problems which result in abnormal failure characteristics, or special production delays. But the dominant problems are the consistently high cost and long lead times of IK's. The overall simplicity of the piece parts comprising IK's leads one to strongly suspect that these problems are correctable merely by obtaining the kits through a competitive process. CSLA consequently desired to determine the best method for obtaining kits.

1.3 Alternative Ways of Obtaining IK's

CSLA identified what they considered to be reasonable alternative methods for obtaining IK's. These are summarized below.

Present Method

Tobyhanna Army Depot, and sometimes Lexington Bluegrass, have been producing the IK's on request by ECOM and now CSLA. This is handled through the Army Industrial Funding system. All of the piece parts, except the most simple, are manufactured by the depots' electrical or mechanical shops. The other parts are purchased locally. The depot supply activity assembles the kits and ships to the COMSEC depot which is located at Lexington-Bluegrass. Costs per kit have been averaging about $800 while lead times are generally longer than one year. Both of these have been increasing sharply in recent years.

Purchase Whole IK from Commercial Source

Here a commercial manufacturer, presumably selected through a competitive process, would replace the Army depot. The basic option is for the IK's to be procured separately from the COMSEC equipment while a variation would be for an IK to be provided with the equipment when delivered by the manufacturer.

Assemble IK's from Piece Parts

Under this alternative, piece parts would be ordered separately and assembled at the COMSEC depot according to guidelines provided by CSLA. All piece parts would be given NSN's. They would be obtained either by procurement or by MILSTRIP requisition through the DoD item manager. The basic plan calls for the CSLA manager of the kit to manage the piece part acquisition and stockage, and to provide specific assembly schedules. Options would be to have the piece part manager, at the COMSEC depot or to provide general priorities for the assembly process instead of a specific schedule.

CHAPTER II

ANALYSIS OF PROBLEM

2.1 Basic Issues

We saw the alternatives as defining four separate issues or questions. These are:

a. From whom should the piece parts be obtained, commercially or depot manufacture?

b. Who should assemble the IK's?

c. When should IK's be assembled?

d. Who should manage the IK piece parts for assembly?

The first three are basically independent questions, while the last depends on the answer to question b.

2.2 Relevant Facts

2.2.1 Piece Part Costs

CSLA is presently procuring a set of IK's for the KG-27. Because of dramatic cost escalation at Tobyhanna they decided to cancel the procurement which had been established there and order the piece parts from commercial source (or through DoD item managers) and assemble them at the COMSEC depot. We were able to obtain piece part cost estimates from Tobyhanna and current estimates from the item managers or commercial manufacturers. The following Table 1 shows the comparison of these costs.

Across the top, each of the nine IK's within the KG-27 group is listed, while all the piece parts used on these nine IK's are listed on the left. The number of applications of each part on each kit is shown in the table. On the far right are shown the commercial and Tobyhanna piece part prices. At the bottom of the table the total piece part cost for each kit is shown for commercial and Tobyhanna. Also, the % reduction in piece part cost from commercial sources is indicated.

For the nine kits, savings from commercial sources range from 39% to 55%. The source of this differential appears to be in the difference in the base labor rates and amounts of indirect support labor.

TABLE 1: KG 27 INSTALLATION KIT PIECE PARTS

PART	PPL 4831	PPL 4141	PPL 4880	PPL 4438	TADSK 7195C	PPL 4807	PPL 4439	PPL 4437	PPL 4926	COMMERCIAL UNIT PRICE	TOAD UNIT PRICE
Shelf	1									11.58	9.90
Cable	7	7	7						7	3.58	12.72
Cable	4	5	4	1	1	1		1	4	17.60	25.00
Cable	4	4	4							15.20	17.31
Bracket	1	1							1	1.35	4.72
Bracket	1	1							1	1.35	4.72
Bracket	1	1							1	2.70	9.50
Decal	2	1	1						2	.32	
Decal	1	1	1						1	.27	
Connector Box	1	1	1						1	23.27	55.00
Washer Flat	16	16	12						16	.42	
Screw	16	16	12						16	.73	
Washer Split	16	16	12						16	.13	
Cable				3		3				5.57	15.40
Cable				2		2				16.50	19.31
Cable					1					27.60	25.00
Cable					5					6.00	13.20
Cable					4					6.00	17.11
Marker						16				.25	
Cable							5			6.00	
Cable							4			7.50	10.91
Cable								3		3.60	19.80
Label								4		.15	
Cable								2		9.87	18.71
Rack			1							122.00	187.65
Piece Part Cost											
Comm. UP	190.51	202.53	301.53	67.31	99.2	99.23	60.00	48.14	124.13		
TOAD UP	342.12	357.22	500.93	109.82	184.44	108.82	132.64	106.82	262.98		
%Reduction	.426	.433	.398	.387	.462	.387	.548	.549	.528		

As of July 1976, the labor rate at Tobyhanna in the Electronics Shops was:

Base Labor	$7.40
Total Indirect	4.03
Base Operations	.62
Gen & Adm	1.50
	13.55

The labor rate at a small electronics manufacturing firm, which had produced some IK parts, at the same time was

Base Labor	$3.67
Overhead Total	2.57
	6.24

Tobyhanna is set up in the main to overhaul and repair electronic equipment. As such, their employees are more highly skilled than those employees needed to produce IK type piece parts. Labor rates are developed by aggregating rates over a wide range of skill levels within a cost center. Consequently Tobyhanna charges inappropriately high labor rates for IK parts. Likewise the large overhead rate at Tobyhanna compared to the commercial source is due again to their main overhaul/repair function which requires much more control activity than does small manufacturing. Here also the costing procedures do not break out overhead costs by type of activity within a cost center so that the purchaser of the IK's is paying for unnecessary support activity.

2.2.2 Assembly Cost

An assessment was made at the COMSEC depot of the cost to assemble a typical IK. This particular IK, which was composed of ten line items, was NSN 5820-832-8014. The following costs were obtained

a. Direct Assembly Labor

11.09 minutes per IK at a labor rate of $12.00/hour. This was estimated from DoD Time and Motion Standards.

b. Packaging Materials Cost

$2.00/kit

c. Picking Piece Parts

20.34 minutes for 10 lines. Time and Motion Standard based on average picking amounts.

d. Warehousing (unloading, receiving, storing)

.41 hours per line item.

e. Management Cost

1 man year, GS-12, is required to manage assembly process. 1 clerical assistant GS-4.

f. Computer Cost

$5500/year

Based upon a workload of 10,000 kits per year which is reasonable according to CSLA's current IK requirement schedule; 300 different piece parts composing all active IK's; and quarterly deliveries of the piece parts the total assembly cost per kit is $14.44. Appendix I gives a more detailed explanation of the cost estimation.

2.3.3 Commonality of Piece Parts

The piece part composition of three sets of IK groups - KY-8, KY-38, KG-27 - was examined. Table 2 shows the frequency distribution of the number of applications of a part within an IK group.

TABLE 2: NUMBER OF PART APPLICATIONS

Number of Kits In Group On Which Part Used	KG-27 Group	KY-8 Group	KY-38 Group
1	10	16	21
2	2	13	11
3	4	11	3
4	7	7	4
5		3	
6		4	2
7	1		1
8		3	
9		1	
10		2	
>10		1	

The column entry indicates the number of parts which are used on the indicated number of kits. For example, within the KG-27 group, 10 parts are used on only 1 kit, 2 parts are used on 2 kits, and 4 parts on 3 kits, etc.

For the KG-27 group there is an average of 9.1 part applications per kit, for the KY-8, 9.7 applications per kit, and for the KY-38 8.7 applications per kit. On the other hand, there are respectively, on the average, 2.7, 2.7, and 4.2 different parts per kit; i.e. number of different parts within IK group divided by number of IK's within the group.

2.2.4 Other Facts

While the number of items is not yet certain, CSLA will be the DoD manager for many of the IK piece parts. DSA will likely manage the largest portion of the items, and ECOM probably will have the remainder. There will be independent demand for some piece parts because of field failure. This should be small overall but may be large temporarily for some items during the development stage.

CHAPTER III

CONCLUSIONS

3.3 Conclusions

The conclusions are presented as answers to the four basic issues listed earlier.

3.3.1 Obtain Parts Commercially

Based upon the KG-27 IK cost comparison, parts should be obtained from commercial sources. There is no reason to believe that the quality of the parts, despite their lower cost, will be less when obtained commercially, since the difference seems to be explained by the difference in labor rates. Moreover, the lead times from commercial sources are comparable to those from Army Depots. This conclusion is based on discussions with IK managers at CSLA and estimates of lead times for the KG-27 piece parts.

3.3.2 Assemble Kits at COMSEC Depot

Given the answer to the source of the parts the alternatives here reduce to two - obtain the kits already assembled from commercial sources or assemble the kits at the COMSEC depot at Lexington-Bluegrass Army Depot. We were unable to obtain estimates of the cost of assembled kits from commercial sources. However, assuming that the cost of an assembled kit is the cost of the parts plus an assembly charge, the amount of savings, if any, in the assembly cost from a commercial source is not significant since the cost of assembly is small compared to the cost of the parts. Moreover, there are advantages to maintaining separate piece part stockage.

There will always be a certain amount of disassembly required. It may be because specific parts within assembled kits are needed elsewhere, kit requirements may have been overforecasted, or parts may become obsolete. The most compelling reason for maintaining separate piece part stockage is due to the high degree of commonality of parts which makes it possible to use some of the parts from kits for which requirements were overstated on kits for which requirements were understated. While this economy is still available with assembled kits, it is offset by the cost to disassemble.

Another advantage is that piece parts may be ordered in larger quantities since all part requirements will be rolled together. Not only will unit prices be less, but also in some cases when the item has separate field requirements, procurement set up costs may be reduced.

3.3.3 Assemble IK's in Small Batches

Given a particular procurement schedule for piece parts, the only benefit to assembling and stocking IK's is in the savings to the set up cost for assembly. The cost risk is that the IK will eventually need to be disassembled. If the set up cost were zero, then the optimal assembly procedure would be to assemble IK's as required - assuming that there are no other benefits to bulk assembly other than the reduction of total set up cost. Since in this case the set up cost is on the order of $10, there is little to gain by assembling large quantities. As an example, assume a reasonable situation where 50 different types of IK's need to be assembled within a given year. In one case assemble IK's in batches of 6 months anticipated requirements, and in the other case assemble IK's in batches of 1 month requirements. The total yearly set up cost in the first case is (50)(2 set ups/year)($10/set up) = $1000. In the second case the cost is (50)(12 set ups/year)($10/set up) = $6000. The difference is $5000. On the other hand the total assembly cost per year is on the order of $150,000. Thus there is little direct cost savings available by manipulating the assembly schedule.

It is recommended, therefore, that no more than a one month requirement be assembled at any time except on residual, low activity programs where 3 months is the recommended maximum.

3.3.4 Manage the Program From CSLA

In all cases CSLA, of course, has the ultimate responsibility for the IK program. The alternatives are to manage the program from CSLA, or create a management position at the COMSEC depot to control the assembly program subject to CSLA supervision. Under either alternative the important decisions are made by the management at CSLA. Because of changing requirements, cost escalation, errors in

forecasting, lack of piece parts, CSLA will be forced to continually review and revise assembly schedules. If a manager were placed at the COMSEC depot, his functions would be those routine operations required to execute the plans of CSLA and his decision making would be limited to determination of specific daily assembly schedules or modification to recommended parts procurement, etc. Additionally, there are no apparent benefits to locating a manager near the assembly location since he would only require information on piece part stock status and IK requirements in order to function.

If CSLA is to manage the program from within, then one individual should be responsible for all IK's within an equipment type group and all of the associated piece parts on those IK's which are managed by CSLA. In this way the benefits cited previously for piece part stockage are more easily achieved.

APPENDIX I

ASSEMBLY COSTS

The following is a list of the parts composing the IK for which the direct assembly labor was estimated.

PARTS LIST

END ITEM: Installation Kit, 5820-832-8014

ITEM NO.	PART DESCRIPTION	QTY/UNIT
1	Cable Assembly, Power, 12'0"	1 ea
2	Cable Interconnecting, Radio 10'0"	1 ea
3	Cable Assembly, Power "Y"	1 ea
4	Kit, Cable Support	1 ea
5	Nut, plain, plate 1/4-28	8 ea
6	Washer, lock, IET 1/4 I.D.	8 ea
7	Screw, hex. hd. 1/2-28 X 1-1/4"	8 ea
8	Mounting, MT-3874/V	1 ea
9	P.C.B. PL-1225/VRC-12	1 ea
10	Installation Instructions	1 ea

The next list indicates the detailed activities required to assemble the kit. TMU Time is taken from DoD publication 5105.34-M, Warehousing Gross Performance Measurement System, and is the direct manhours expressed in hundredths of hours required to perform the activity. The total direct manhours is .14713. Additionally, the Personnel, Fatigue, and Delay (PFD) allowance - 20% of workman's day is spent on PFD - converts the direct manhours to actual manhours of .18491. At a labor rate of $12.00 the cost is $2.22.

PACK INSTALLATION KIT

(5820-832-8014)
10 Line Items

This standard includes all the time necessary to pack (or process) one installation kit. The standard begins with a verification of the material received, includes the time to prepare intermediate packs and ends when the material is packed, the carton stenciled and overtaped with reinforced tape.

	DESCRIPTION	CODE	TMU TIME
1.	Assemble medium carton	BMAM	595
2.	Insert and align items in carton (10 Line Items)	BMIC	828
3.	Insert packing material (5)	BMIP	850
4.	Close and seal carton	EEOC (BMSN)	379
5.	Tape each end of carton top & bottom	BMAM	
		1-23(4)	308
		1-25(4)	676
6.	Invert carton for taping (2)	1-08	40
7.	Get and aside tape (4)	BSME	308
8.	Tape carton w/reinforced tape (4)	BMAS	720
9	P/up & aside scissors (4)	BMCC	368
10.	Cut tape (4)	BMCC	184
11.	Stencil carton (5)	ETMP	323
12.	Reach, grasp and move items (61)	BCOA	3355
13.	Insert items in bags (2)	BMII	2989
14.	Staple bag closed (2)	BESP	230
15.	Fold packing list (2)	BCPF	300
16.	Insert into pressure sensitive envelope	BCIR	364
17.	Apply packing list to carton	BMAX	237
18.	Walk to and from items (40 paces)	BWOB	853
19.	Dac processing per pack	ECLP	409
20.	Place carton on pallet	EHPS	397

Total normal time, manhours	.14713
Total allowed time (Personal, Fatigue & Delay, 1.25% allowance)	.18491

Computer costs are indicated on the following. The costs are broken down by one time and recurring. These were obtained from CSLA. With 10,000 kits assembled per year, the recurring cost is $.55/kit.

Computer Cost Requirements for COMSEC Directorate - Alternative 4d

a. One time cost:

(1)	One man month to define requirements: GS12/4	$1,800.00
(2)	Three man months to develop programs: GS12/4	$5,400.00
(3)	40 hours test time IBM360 at Ft. Huachuca: $62.00 per hour	$2,480.00
(4)	Two TDY trips to Lex Ky 5 days duration each	$ 980.00
Total one-time cost computer operations		$10,660.00

b. Continuing daily cost for computer support:

(1)	One and one half (1-1/2) hour semi-weekly run for management purposes at $35.00 per hour at annual cost of:	$5,460.00

Based on factors supplied by CSLA, the following table shows the management time required by function. This equates to approximately $5/kit assuming assembly of 10,000 kits/year.

MANAGEMENT COST

FUNCTION	HR/WK	COMMENTS
Stock Status Review	16 hrs.	
Correspondence	5	
Establishing Due In	.33	20 orders/wk; 1 min/order
Processing Receipts	.33	20 receipts/wk; 1 min/receipt
Procurement		
Local	1.5	3 order/wk; 30 min/order
AIF	1.5	" "
MILSTRIP	1.117	14 orders/wk; 5 min/order
Follow Up for Supply Status	.33	4/wk
Assembly/Disassembly	.87	25 kits/wk; 20 min/kit
Inventory Adj.	1.25	2.5/wk; 30 min/adj.
Transfer of IK to Depot Stock	1.25	2.5/wk; 30 min/trans.
TOTAL	26.44	
+ Finance	20 hrs	
+ GS4 Clerk Typist		

Indirect Warehousing Times

Unloading, Receiving, & Storing .413275 min/line item

300 parts ordered quarterly gives total yearly cost of (.413275) (1200 order/year)(12.00) = \$5951.16

With 10000 kits per year this equates to .60/kit

Physical Inventory Cost is negligible.

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